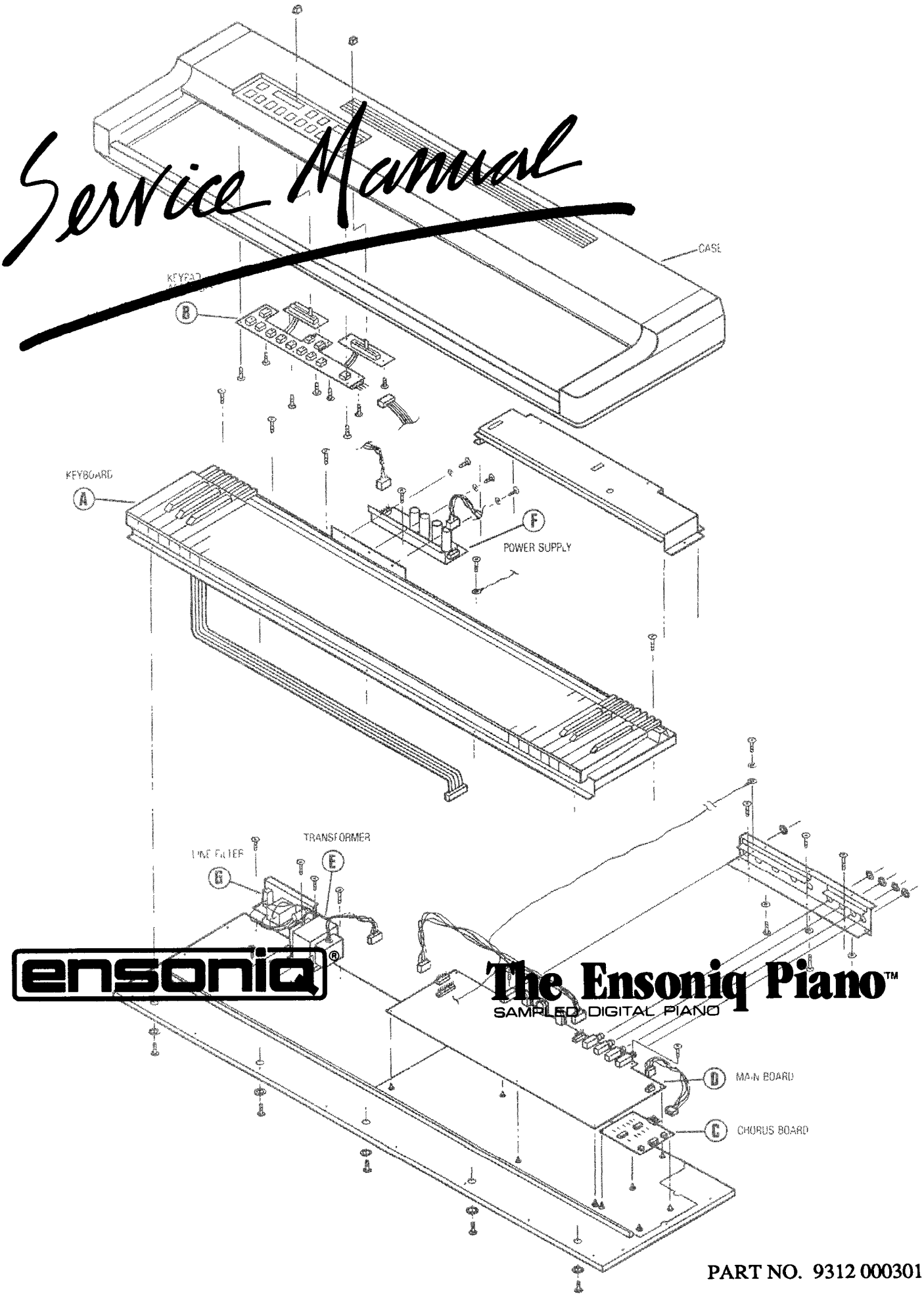
Service Manual



ensoniq®

The Ensoniq Piano™

SAMPLED DIGITAL PIANO

PART NO. 9312 000301

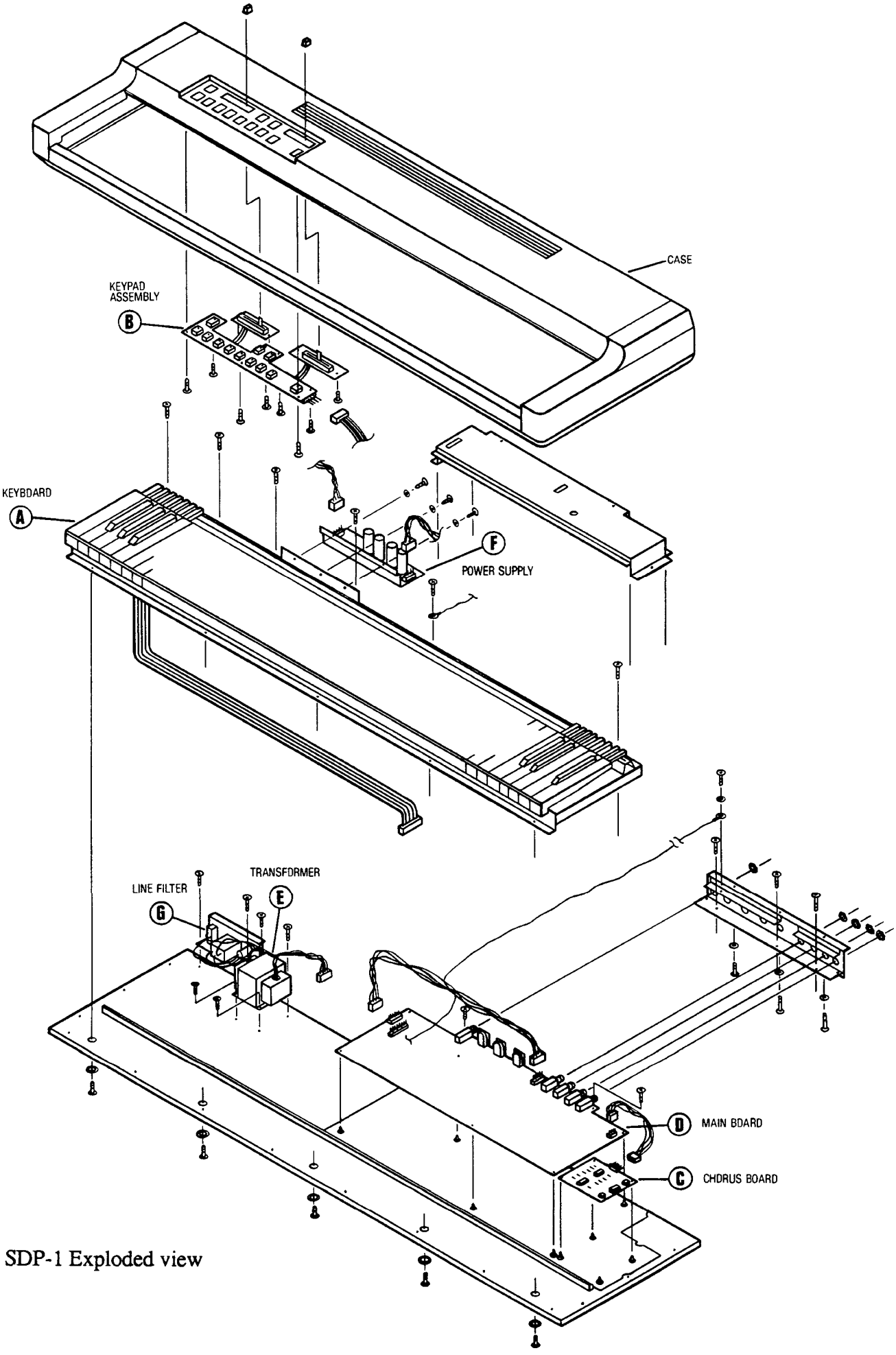


Figure 1 - SDP-1 Exploded view

As with every ENSONIQ product, all service of the Ensoniq Piano (Model **SDP-1**) will be handled through the Ensoniq Module Exchange Program. Rather than diagnose and exchange individual components, you will replace complete modules. We feel that this is the most time and cost effective method of repair, both for you and your customers.

REMOVING AND REPLACING THE CASE

Virtually all service to the **SDP-1** will require removing the outer plastic case. This should be done with great care.

<u>To remove the case:</u>

1. Remove all cables, including the AC power cable from the unit.
2. Place the unit upside down on a soft surface and remove the 24 perimeter screws that attach the case to the bottom of the instrument. Four of these screws are located directly above the jack panels. Do not remove the 5 larger screws.
3. Carefully turn the unit back over, with the keyboard facing front. Gently pull the back of the case up while maintaining a slight rearward pressure. When the back of the case is free of the jack panels, pull the case forward until the front of the case clears the keyboard. Disconnect the keypad cable at the Main Board, making a note of the correct orientation of the connector. The case should now be completely free of the unit Base.

<u>To replace the case:</u>

1. Place the unit base on a flat surface with the keyboard facing front. Make sure all cabling and hardware is connected and in its proper place.
2. Reconnect the keypad cable to the Main Board.
3. Ease the front of the case down over the keyboard. Once the front of the case is positioned below the front of the keyboard, gently push down on the back of the case while maintaining a slight rearward pressure.

CAUTION: Do not attempt to force the case down. If there is <u>any</u> firm resistance, stop and check the unit for any cables or hardware that may have come between the case and the unit base.

4. Place the unit upside down on a soft surface. Make sure that the wooden base fits flush into the case before replacing the 24 case screws. Be careful not to overtighten the four screws that attach the top of the jack panel to the case.

CHECKING THE POWER SUPPLY

Many **SDP-1** problems may be related to a faulty Power Supply, Transformer or Line Filter. You should check these before troubleshooting the rest of the unit.

Remove the plastic outer case as described above. Check to make sure that all the connections are secure and correct. Plug the **SDP-1** in and turn it on. When it has warmed up for five minutes, begin to test the voltages at the points shown in Figures 2 and 3. If the voltages vary outside the allowable limits, replace the Power Supply before troubleshooting the unit further.

TRANSFORMER AND POWER SUPPLY VOLTAGE CHECK POINTS

Check to see that AC Line voltage reads across the check points indicated below. The proper AC Line Voltage for each **SDP-1** is printed on the top of the Transformer. Figure 2 below shows the check points for reading the AC Line Voltage. It is normal for Line Voltage to vary +/- 10%.

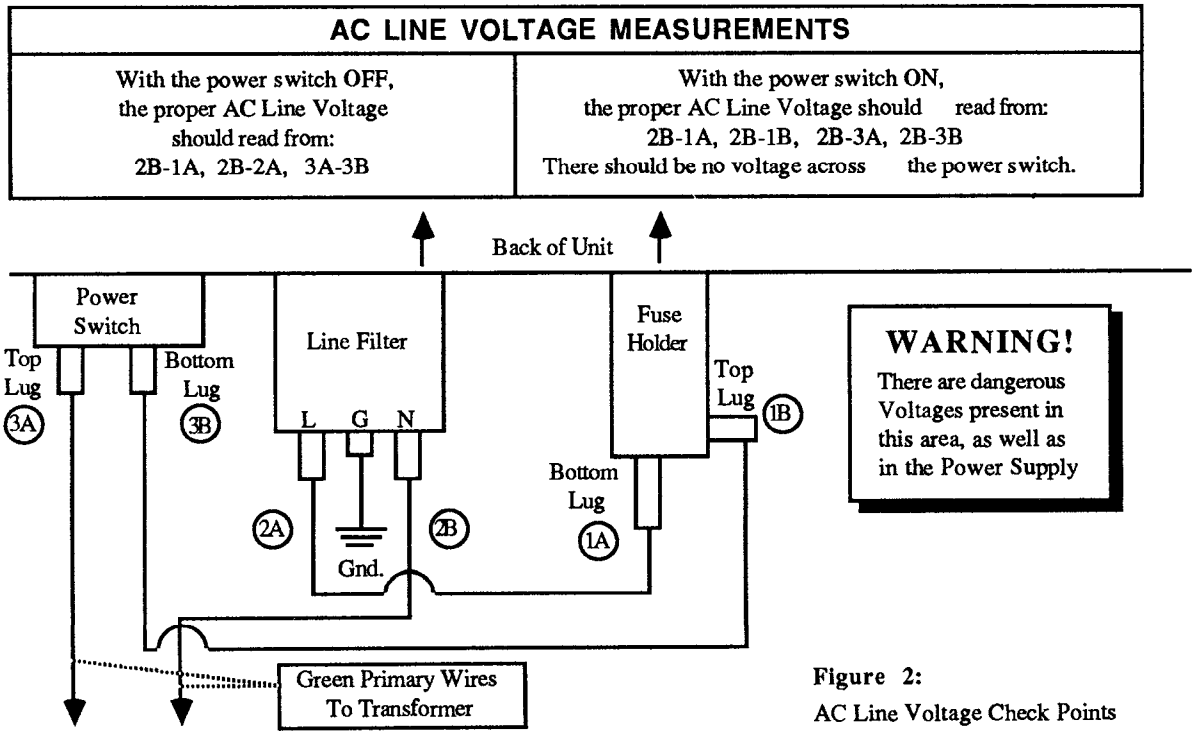

AC LINE VOLTAGE MEASUREMENTS
With the power switch OFF, the proper AC Line Voltage should read from: 2B-1A, 2B-2A, 3A-3B
With the power switch ON, the proper AC Line Voltage should read from: 2B-1A, 2B-1B, 2B-3A, 2B-3B
There should be no voltage across the power switch.
Back of Unit
Power Switch
Top Lug
3A
Bottom Lug
3B
Line Filter
L G N
2A
2B
Gnd.
Fuse Holder
Top Lug
1B
Bottom Lug
1A
WARNING!
There are dangerous Voltages present in this area, as well as in the Power Supply
Green Primary Wires To Transformer

Figure 2:
AC Line Voltage Check Points

POWER SUPPLY MEASUREMENTS

Figure 3 shows the connector terminal numbers to read across with the voltmeter. The chart below lists the voltage ranges for proper operation of the Power Supply (fully loaded).

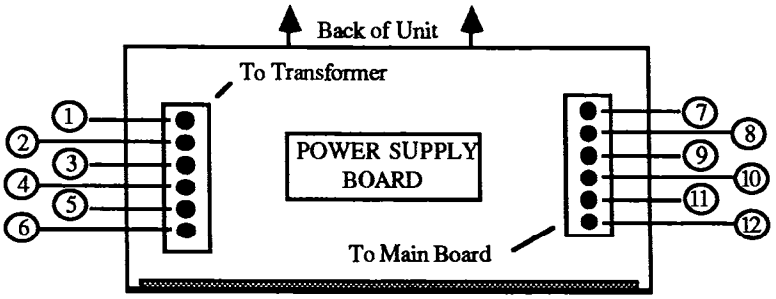


FIGURE 3 - Power Supply Voltage Check points

Designation	Terminals +	Terminals -	Allowable Range	Units
Digital Supply	1	2	13 to 19	VACrms
Analog Supply	5	6	23 to 29.5	VACrms
+5 Digital	8	7	+4.8 to +5.25	VDC
+5 Analog	9	7	+4.8 to +5.25	VDC
Ground	7	10	0 (connections are common)	VDC
+12 Analog	11	10	+11.4 to +12.6	VDC
-12 Analog	12	10	-11.4 to -12.6	VDC

TROUBLESHOOTING GUIDE

SYMPTOM	Possible cause (in order of likelihood)
Unit completely dead (no LEDs, no Audio)	AC connections good? Fuses OK? Power Supply Main Board Cable from Power Supply to Main Board Cable from Keypad to Main Board
Unit crashes during operation	Main Board Power Supply
Unit crashes, then reboots by itself	Main Board
No Audio	Main Board Power Supply
No Audio, but will play Burn-in sequence (see Test Procedures, below)	Main Board Keyboard Keyboard Cable
Distorted or weak audio	Main Board Power Supply (Check +12v/-12v for ripple)
Excessive noise in audio	Main Board
Output level doesn't track Volume slider	Keypad Main Board Keypad Cable
Transpose not functioning correctly	Keypad Main Board Keypad Cable
No Filters tune correctly (see Test Procedures)	Main Board Power Supply
One or more Filters not tuning correctly	Main Board
Bottom or top row of LEDs out (but switches work)	Main Board Keypad Keypad cable
Any one or more switches and/or LEDs not working	Keypad Keypad cable Main Board

TEST PROCEDURES

The **SDP-1** has a number of Test Procedures built into its internal ROM which can help you to qualify certain kinds of problems. These tests are executed by pressing various combinations of buttons, as described below. Performing these tests in conjunction with a known good Keypad assembly (included in the Parts Kit) can help isolate Main Board problems which at first seem to be Keypad related. These procedures are also useful for testing **SDP-1** functions after repairs are completed.

FILTER Test: Tests each of the ten filters to make sure that it will tune and is functioning properly.

To execute: While holding down the *MIDI Channel* Button, press the *Stereo* Button. The LEDs should light rapidly in succession (taking less than a second) and then return to normal playing mode.

Diagnosis:
- If a Filter fails to tune, one of the LEDs will light for two (2) seconds, then flash ten times. Then the **SDP-1** procedes to check the next Filter.
- If one or more (but less than all ten) Filters fail, a Main Board problem is indicated.
- If all ten Filters fail, the LEDs will flash slowly in reverse sequence. A Main Board or Power Supply problem is indicated.

LED Test: Lights each of the 12 LEDs for one second.

To execute: While holding down the *Stereo* Button, simultaneously press the *Bank A* and *Bank B* Buttons. Each LED should light in turn for about one second, and then the **SDP-1** will return to normal operation.

Diagnosis:
- Failure of any of the 12 LEDs to light (assuming the **SDP-1** is otherwise functioning normally) will usually indicate a bad LED on the Keypad board, in which case you should replace the Keypad Board. However, the problem could also be the cable to the Keypad Board, or in some cases the Main Board.

KEYPAD Test: Tests for open and shorted switches on the keypad.

To execute:
1) While holding down the *Octave* Button, simultaneously press the *Stereo* and *MIDI* Buttons, and then release all three buttons. All 12 LEDs will light in sequence, and then stop, during which time the software tests for shorted switches. Then the LEDs will light in sequence again.
2) After the second sequence, press all 12 buttons in any order. This Tests for open switches.
3) While holding down the *Bank B* Button, press *Bank A*. If the unit passes, the LEDs will flash in sequence once more and then return to normal operation.

Diagnosis:
- If one LED remains flashing after the first sequence, this indicates a shorted switch. An LED left flashing after the second sequence indicates an open switch. In either case, the problem is likely the Keypad Board or the cable leading to it. Again, however, it is possible for a Main Board problem to cause a failure here.

BURN-IN Test: This is the test used at the factory to Burn in units before shipping. It tests the internal RAM and all the voicing hardware. The Piano should be connected to a sound system so that you can hear its output. Note that once set in motion this test will run forever until the unit is turned Off.

To execute:
1) Press the *MIDI Channel* Button to enter MIDI Mode.
2) While holding down the *Stereo* Button, simultaneously press the *Bank A* and *MIDI Channel* Buttons.
First the **SDP-1** quickly tests its internal RAM; then the 12 LEDs will flash in sequence (the Filter Tuning Routine described above). It then selects the Piano 1 sound and begins playing chromatically up the keyboard, using all eight piano voices. After one complete pass it will select the Electric Bass sound and play chromatically up through its range, using the two bass voices. Then the whole procedure begins again, repeating endlessly until the unit is shut off.

Diagnosis:
- The first Step is the RAM Test. If the **SDP-1** fails this test, the 12 LEDs begin slowly flashing in reverse sequence, and continue doing so. This indicates bad RAM. Replace the Main Board.
- After the RAM test is the Filter Test, described above. See **Filter Test** for failure modes.
- If it passes the RAM and Filter tests and makes it to the Sound test, listen to be sure that all voices sound evenly. This test uses eight voices during the piano part – if every eighth note is missing or distorted, a Main Board problem is indicated. Two voices are used during the Bass test. Every other note missing or distorted indicates a Main Board problem.

KEYBOARD SHIELD

There is a thin metal shield attached to the bottom of the keyboard frame directly above the Main Board. On a few early units a large molded shield was used which covered the entire board. This shield is stapled to the wooden base and must be removed in order to replace the Main Board. If you encounter one of these units, the large molded shield should be replaced with one of the thin Metal shields. Call ENSONIQ Customer Service if you need the thin metal shield.

SECTION

A

Replacing the Keyboard

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Gently place the base assembly, component side down, on a soft surface, exposing the underside of the unit. Remove the five (5) large screws and flat washers.
4. Return the base assembly to an upright position with the Keyboard facing to the rear. Remove the two (2) screws connecting the green ground wires to the keyboard frame.

NOTE: There are star washers located between the lugs of the ground wires and the keyboard frame.

5. Remove the three (3) screws and star washers attaching the heat sink of the power supply to the keyboard frame. Remove the five (5) large screws securing the Keyboard to the wooden base.
6. Tilt the keyboard assembly back and disconnect the thirty-four (34) pin ribbon cable at the keyboard end, paying particular attention to polarity.
7. Carefully remove the Keyboard from the base.

IMPORTANT! Always grasp the keyboard frame when lifting or maneuvering the keyboard assembly. Any attempt to move the keyboard assembly by the keys themselves will result in serious damage to the keyboard mechanics.

8. Place the new Keyboard into position on the wooden base, taking care to line up the holes in the keyboard frame with those in the wooden base. Tilt the keyboard assembly back and reconnect the 34 pin ribbon cable. Make sure that the ribbon cable is not being pinched under the keyboard frame when the frame is lowered back into place.
9. Replace the five (5) large screws removed in step 5.
10. Replace the three (3) screws and star washers that attach the Power Supply to the keyboard frame. Reconnect the two green ground wires to the keyboard frame.

NOTE: The star washers must be placed in between the ground wire lugs and the frame. Failure to do so will create grounding problems.

11. Turn the base assembly over, exposing the underside of the unit, and replace the five (5) large screws and flat washers.
12. Turn the unit back over. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the instrument before replacing the 24 case screws.

NOTE: In later models the connector on the keyboard was moved from the center to the far left, requiring a longer keyboard cable. Call ENSONIQ Customer Service if you need the longer keyboard cable.

SECTION

B

Replacing the Keypad Assembly

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**). Remove the Keypad cable from the Main Board at J1, but leave it connected to the Keypad Board for now.
3. Carefully remove the knobs from the Volume slider and the Transpose switch.
4. Place the case upside down on a soft surface with the keyboard cutout facing you.
5. Remove the thirteen (13) screws that fasten the Keypad assembly to the plastic case. Remove the Keypad assembly from the case.

NOTE: You will notice that the Keypad assembly is actually made up of three separate circuit boards. These boards are permanently inter-connected, however, and must be removed and replaced as one unit. When you receive a replacement keypad assembly, the three boards are still connected together. Using a pair of small gauge wire cutters, carefully cut the two small slider boards free from the keypad board, taking care not to damage the wires that connect them.

6. Remove the twenty-pin ribbon connector from the old Keypad assembly and connect it to the new Keypad assembly, paying particular attention to proper polarity. Re-install the 2 knobs onto the faders.
7. Install the new Keypad assembly in its proper position in the plastic case and replace the thirteen (13) screws that hold it in place. Be careful not to overtighten the screws.
8. Re-attach the Keypad cable at J1 on the Main Board and replace the case as per **REMOVING AND REPLACING THE CASE**. Test the instrument before replacing the 24 case screws.

SECTION C

Replacing the Chorus Board

NOTE: Use Chorus board with 4501 Main Board only (SEE HARDWARE NOTES).

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Remove the keyboard assembly, as described in Steps 1-7 of **Section A**.
4. Disconnect the six (6) pin cable from the Chorus Board at J1. Note that the connector is keyed.
5. Remove the Chorus Board by squeezing the standoffs and gently lifting the board out.
6. Pop the new Chorus Board into place on the four standoffs, and reconnect the six pin cable at J1.
7. Replace the Keyboard assembly as described in Steps 8-12 in **Section A**.
8. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the unit before replacing the 24 case screws.

SECTION D

Replacing the Main Board

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Remove the keyboard assembly, as described in Steps 1-7 of **Section A**. Note however that the thirty-four (34) pin ribbon connector should be removed at the Main Board (J2) instead of at the keyboard.
4. Remove the five (5) nuts from the rear panel jacks marked Bass, Right , Left/Mono, Headphones and Foot Pedal.
5. Disconnect the Power Supply cable at J7 and the Chorus cable at J12 on the Main Board.
6. Remove the ground screw and star washer located next to the Bass jack (J11). Remove the hold-down screw located next to the Foot Pedal jack (J3).
7. Pop the Main Board from the four white standoffs by squeezing the standoffs, and gently lift it out. Do not remove the cardboard insulator located beneath the Main Board.

NOTE:

8. See HARDWARE NOTES for replacing a 4501 Main Board with a 6001 mainboard. Hold the new Main Board at a slight angle while inserting the jacks into the holes in the rear panel. Snap the board onto the four standoffs.
9. Replace the five nuts on the rear panel jacks; then replace the ground screw (with star washer) and hold-down screw removed in Step 6.
10. Reconnect the Power Supply cable at J7 and the Chorus cable at J12 on the Main Board.
11. Replace the Keyboard assembly as described in Steps 8-12 in **Section A**, making sure to reconnect the keyboard cable.
12. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the unit before replacing the 24 case screws.

SECTION E

Replacing the Transformer

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Disconnect the Transformer from the Power Supply, power switch and the line filter, making a note of the proper polarity.
4. The Transformer is held in place by four (4) screws which go into T-nuts set into the bottom of the wooden base. Remove the four screws that secure the Transformer, and remove it.
5. Place the new Transformer into position and replace the four (4) screws which hold it to the base.
6. Reconnect the Transformer cables.
7. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the unit before replacing the 24 case screws.

SECTION F

Replacing the Power Supply

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Disconnect the two six-pin connectors (at CN2 and CN3) from the Power Supply Board. Note that these connectors are keyed.
4. Remove the three (3) screws that connect the Power Supply heat sink to the keyboard frame, and remove the Power Supply.
5. Place the new Power Supply Board into position and replace the three (3) screws which secure it to the keyboard frame. Note that these screws have star washers.
6. Reconnect the two six-pin connectors at CN2 and CN3.
7. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the unit before replacing the 24 case screws.

SECTION G

Replacing the Line Filter

1. Remove all cables connected to the **SDP-1**, including the power cable.
2. Remove the outer plastic case (see **REMOVING AND REPLACING THE CASE**).
3. Remove the three (3) wire tabs connected to the back of the Filter, paying particular attention to polarity.
4. Remove the two (2) screws and nuts that secure the Filter to the case. Note that there are lock washers on both the inside and the outside.
5. Install the new Line Filter from inside the case and reconnect the three (3) wires to the Filter, again noting the proper polarity. Failure to connect the wires to their proper posts can lead to a potential shock hazard.
6. Reconnect the the Keypad cable and replace the case (as per **REMOVING AND REPLACING THE CASE**). You should test the unit before replacing the 24 case screws.

HARDWARE NOTES

A. REPLACING A 4501 MAIN BOARD WITH A 6001 MAIN BOARD

1. With pliers, remove the standoff (near Y1) that supported the center of the 4501 board.
2. Remove the Stereo Chorus Board. The Stereo Chorus Board will not be needed as it is designed into to the 6001 Main Board.
3. Insert sticky standoffs in the two leftmost holes of the 6001 board (jacks away from you).
4. Solder the wire tail end of the ground wire provided to the ground square at the center of the board in between the jacks.
5. Remove the backing from the two standoffs.
6. Remove the screw from the jack panel which fastens the ground wire to the keyboard. Combine the spade lug end of the new ground wire with that of the ground wire coming from the keyboard and reconnect both ground wires to the jack plate by replacing the screw.
7. When replacing the keyboard, bend the radial capacitors out of the way of the keyboard rail. If C12 and C14 are radial, bend them down to prevent garbled sound information. Make sure the Main Board is not being flexed.

B. GARBLED SOUND INFORMATION

It is possible for some garbled sound information to occur while playing near the center of the keyboard. This may be caused by some of the radial capacitors in the lower left corner of the 6001 board (C12, C14) shorting to the keyboard. To eliminate this garbled sound information, bend these caps out of the way.

In the US: 155 Great Valley Parkway Parkway • Malvern, Pennsylvania 19355
Parts Ordering 1-800-441-1003

In Canada: Kaysound Imports, Inc.
6969 Trans Canada Highway • Suite 105 • St. Laurent, Canada H4TIV4
Parts Ordering 514-331-842

SDP-1 Service Bulletin # 1

July 14, 1987

THIS BULLETIN COVERS:

- **Differences between 4501 Main Boards with 6001 Main Boards**
- **Keyboard and Stereo Chorus Board Updates**
- **Operating System Chip Information**

The same main board (6001) is now being used for both the SDP-1 Piano and the SPM-1 Piano Module. The new main board incorporates both the Tower Board and the Stereo Chorus Board of the old board (4501). There is no functional difference between the two boards. If an old board (4501) is to be replaced by a new board (6001), two sticky standoffs and a ground wire are needed to adapt the base. A unit with a 6001 main board should only be replaced with another 6001 main board.

Any replacement 4501 board you receive should have the Tower Board added to the right hand side of the board. This Tower Board contains EQ Circuitry which gives the SDP-1 a "brighter" sound. When ordering replacement boards, please inform Customer Service which main board you have to ensure that you are shipped the correct replacement.

When the 6001 is used in the SPM-1, the keyboard processor, U4, may be left out of the socket. All replacement (6001) boards you receive, however, should include the keyboard processor.

HARDWARE NOTES

A. REPLACING A 4501 WITH A 6001

1. With pliers, remove the standoff (near Y1) that supported the center of the 4501 board.
2. Remove the Stereo Chorus Board.
3. Insert sticky standoffs in the two leftmost holes of the 6001 board (jacks away from you).
4. Solder the wire tail end of the ground wire provided to the ground square at the center of the board in between the jacks.
5. Remove the backing from the two standoffs. Install the board.
6. Remove the screw from the jack panel which fastens the ground wire to the keyboard. Combine the spade lug end of the new ground wire with that of the ground wire coming from the keyboard and reconnect both ground wires to the jack plate by replacing the screw.
7. When replacing the keyboard, bend the radial capacitors out of the way of the keyboard rail. If C12 and C14 are radial, bend them down to prevent garbled sound information. Make sure the main board is not being flexed.

B. GARBLED SOUND INFORMATION

It is possible for some garbled sound information to occur while playing near the center of the keyboard. This may be caused by some of the radial capacitors in the lower left corner of the 6001 board (C12, C14) shorting to the keyboard. To eliminate this garbled sound information, bend these caps down out of the way.

HARDWARE NOTES (cont.)

C. KEYBOARDS

Two keyboards are now being used: one with the connector on the left end of the keyboard and the other with the connector on the middle of the keyboard. Please inform Customer Service which keyboard you have to ensure that you are shipped the correct replacement keyboard and/or cable.

Left End Connector: use long keyboard cable
Middle Connector: use short keyboard cable

D. STEREO CHORUS BOARD UPDATE (FOR UNITS WITH SERIAL NUMBERS 10000 TO 10500)

A simple modification of the Stereo Chorus Board (4090004101) can be performed to reduce excess noise:

1. Find R29. If there is a 2200 pf capacitor soldered across R29 then remove that capacitor.
2. Find and remove C15 (220 pf) and replace it with a 1000 pf capacitor.
3. Find R39. Tack solder a 0.12 µf capacitor across it.

NOTE: Do not change the setting of the trim pot labeled POT1. This trim pot is not affected by the capacitor change.

ENSONIQ will provide one (1) 1000 pf capacitor and one (1) 0.12 µf capacitor at no charge.

SOFTWARE NOTES

A. LOCATION OF OPERATING SYSTEM CHIP

4501 Main Board : U16
6001 Main Board : U6

B. VERSION NUMBERS

The version number of the Operating System and the part number printed on the chip coincide as follows:

Part Number	O.S. Version
1355500102	1.0
1355500139	1.3
1355500141	1.5
1355500145	1.7

O.S. 1.5: Allows the SDP-1 to respond to 88 note keyboard controllers.
O.S. 1.7: Fixed a bug which allowed random notes to play when the piano was being controlled by an external instrument or sequencer (intermittent).

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In the US: 155 Great Valley Parkway • Malvern, Pennsylvania 19355
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In Canada: Kaysound Imports, Inc.
6969 Trans Canada Highway • Suite 105 • St. Laurent, Canada H4TIV4
Parts Ordering 514-331-8420

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